

REMARKS

This Amendment is submitted in response to the Office Action dated March 4, 2004, having a shortened statutory period set to expire June 4, 2004. In the present Amendment, Claims 2 and 9-11 have been cancelled, and Claims 12-17 have been added. Claims 1, 3-8, and 12-17 are now pending.

Objections to the Specification:

The title of the invention has been objected to as not descriptive. As indicated above, a replacement title is proposed herein which Applicants believe is sufficiently indicative of the invention to which the presently pending claims are directed as requested by the Examiner.

Objections to the Drawings:

The specification has been amended to address the Examiner's observation that reference numerals 504 and 604 have both been used to designate the dual-pulse generator depicted in Figure 6, the specification has been amended. Specifically, and as set forth in the foregoing amendments to the specification, the paragraph beginning on page 18, line 1 has been amended to replace the erroneous use of "604" and to replace with "504."

Responsive to the Examiner's correct observation, Figure 3 has been amended as indicated on the attached amended figure sheet to include the legend "Prior Art."

The specification has been amended to address the Examiner's objection to references in the specification to a Figure 2A. Specifically, the paragraphs beginning on page 4, line 10, and page 4, line 16 have been amended to replace FIG. 2A with the correct reference to FIG. 4A.

Applicants believe the foregoing amendments to the drawings and specification sufficiently address the Examiners objections and appreciate the Examiner's diligence in detecting such errors.

Claim Rejections Under 35 U.S.C. § 102:

Claims 1-11 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,544,342, issued to *Dean* (hereinafter *Dean*). Applicants respectfully traverse these rejections under 102(b) as they may apply to the claims as amended and added herein for the following reasons.

Regarding the grounds for rejecting independent claim 1, Applicants agree that in Figures 10 and 12 *Dean* discloses a pulse generator (214) operable to produce pulse signals responsive to both rising and falling edges of control signals produced by a control element (C-element 212). However, Applicants note that the system incorporating C-element 212 and pulse generator 214 is not a “micropipeline” in the sense used in Applicants’ specification (i.e. an asynchronous pipeline design utilizing bundled data with a localized handshake protocol to control data transfers). Instead, Figure 10 illustrates a centralized clocking system 200 that “uses a self-timed, synchronous pipeline sequencing structure, thereby substantially avoiding the complexities of a fully asynchronous system.” (col. 20, lines 18-20). Included within dynamic clocking system 200 is a clock generator 204 in which C-element 212 and pulse generator 214 are used to generate a two-phase clocking signal delivered via a clock distribution network 208 to functional units 202a-202d.

In contrast to the adaptive synchronous system disclosed by *Dean*, Applicants’ proposed invention is directed to an asynchronous pipeline design. Applicants’ Figure 5 illustrates an asynchronous pipeline 500 in which data is sequentially processed through a series of combinatorial processing stages 222 and 224 using a control circuit 515 that employs a localized handshake protocol to control propagation of data from one stage to the next. An important aspect of Applicants proposed invention lies in deploying rising and falling pulse generator means (dual pulse generators 502, 504 and 506) between each control element (elements 202, 204 and 206 in Figure 5) and a corresponding latching stage along the processing stages of the pipeline to achieve two-phase, asynchronous data transfer control.

Independent claims 1 and 8 have been amended in an effort to more clearly and specifically characterize and distinguish Applicants’ proposed invention from the subject matter disclosed by *Dean*. As amended, claim 1 recites a two-phase asynchronous pipeline including, in part, “a control path for generating asynchronous data transfer control signals ... comprising a plurality of sequentially coupled control elements” and “a pulse generator interface coupled between said control path and said data path and operable to translate both rising and falling edges of the data transfer control signals into data transfer pulses applied to corresponding said latching stages.” (Emphasis added). Nothing in *Dean* discloses or suggests a control path or an asynchronous pipeline including control element/pulse generator features structurally or functionally equivalent to those recited in amended claim 1.

Independent claim 8 has been similarly amended to structurally and functionally characterize a claimed pipeline control circuit as providing asynchronous (i.e. localized) data transfer control between stages of a pipeline. Specifically, claim 8 now recites a “pipeline control circuit” including, in part, “a plurality of sequentially coupled C-elements for providing sequential data transfer control among the plurality of data processing stages, wherein each of said plurality of sequentially coupled C-elements includes a control output, a first input coupled to the control output of a preceding control element, and a second input coupled to the control output of a subsequent control element” and “a plurality of dual-pulse generators each receiving as input the control output from a corresponding one of said plurality of C-elements, each of said dual-pulse generators translating signal transitions from the control outputs of said C-elements into latch control pulses applied to said plurality of latching stages.” (Emphasis added). Newly added independent claim 16 recites a method including asynchronous processing and control steps analogous to the function and structure set forth in device claims 1 and 8.

Since neither *Dean* nor any other prior art known to Applicants discloses or suggests a device or method combining pulse generator and control element functionality within an asynchronous pipeline in the manner set forth in claims 1, 8 and 16, it follows that these and all claims depending therefrom are patentably distinct from these references. A Notice of Allowance to that effect is respectfully requested. Applicants have diligently responded to the Office Action by pointing out with particularity how the claims clearly define and distinguish the proposed invention from the prior art, and furthermore invite the Examiner to contact Applicants at telephone number (512) 343-6116 if such communication would help to expedite the continued prosecution of the present application.

No extension of time for this response is believed to be necessary. However, in the event an extension of time is required, that extension of time is hereby requested. Please charge any fee associated with an extension of time as well as any other fee necessary to further the prosecution of this application to **IBM CORPORATION DEPOSIT ACCOUNT No. 09-0447**.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Matthew W. Baca', with a long horizontal flourish extending to the right.

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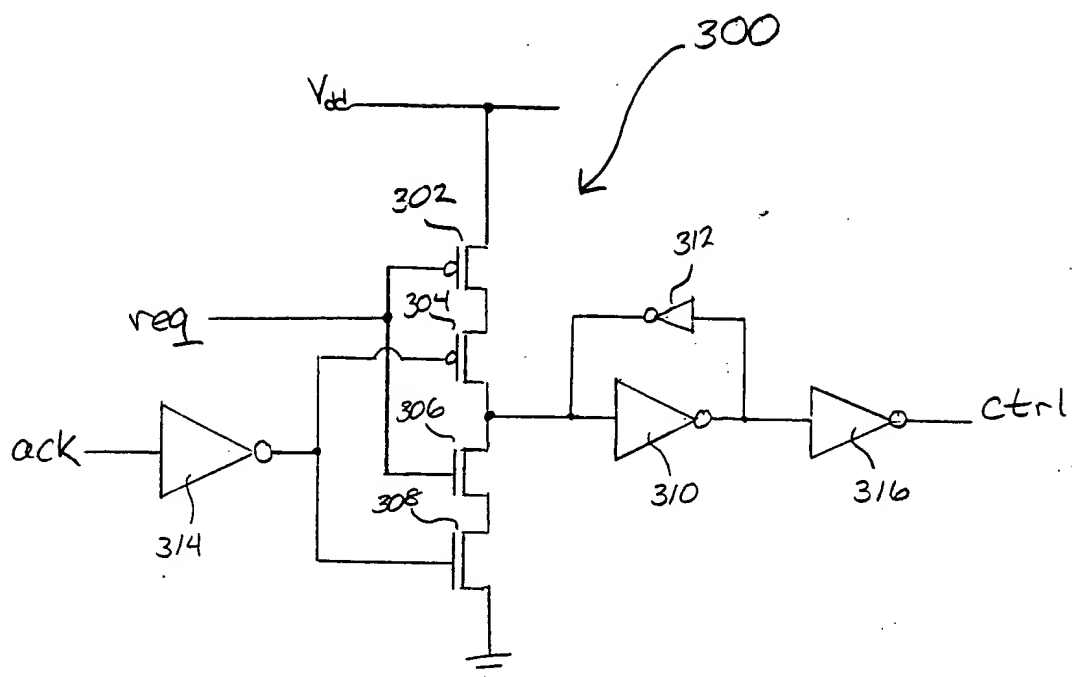


FIG. 3

-- Prior Art --